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Abstract

This paper presents new estimates of the social rates of return to a high school and to a four year college education for males and for females in the U.S. for each year from 1967 to the present based on microeconomic data from U.S. Census Bureau surveys. These are compared to the real rates of return to investment in plant and equipment and in housing since 1947.

New use of the rate of return formula applied to each marginal level separately reveals drastic declines in returns to a junior high school education for those who leave (from 21% to 7%), steady rates of return to a high school education averaging 12%, and real rates of return to the college level rising gently to 12-14% levels in the late 80's, with a dip in mid 70's. Lower real rates of return to housing, including capital gains, of 5% in this period, and higher 15% real returns to plant and equipment investment suggest that there is overinvestment in housing relative to plant and equipment, and relative to human capital in the U.S. This is in spite of the more rapid increases in the stock of human capital using both cost-based and market-wage based estimates of its value. Perhaps due to the advantages in applying the new technology, thus far there is no evidence of diminishing returns to higher education in the U.S.

Relative Returns to Human and Physical Capital in the U.S. and Efficient Investment Strategies

Walter W. McMahon

This paper addresses the efficiency of the allocation of scarce investment resources as between human capital, physical plant and equipment, and housing capital in the U.S. in the period from 1947 to the present.

New elements in this analysis include direct computation of the internal rate of return to each level of education for each year from 1967 through 1988 on a consistent basis which avoids the averaging over levels that occurs by other methods, comparisons to rates of return to investment in housing capital and to non-housing fixed capital, and comparisons among new estimates of the growth of human and physical capital stocks. Some interesting new insights are offered, including, for example, declining rates of return in the U.S. to the junior high school level for those who do not continue beyond that point.

How efficiently our mixed economy allocates the nation's productive assets is certainly one of the most important questions that faces any society. There is need for accurate measurement of the relative returns, both monetary and non-monetary net of costs, and evaluation of their implications. There is also need for attempts to understand the reasons for what on the surface sometimes appear to be conflicting findings, and attempts at reconciliation, including the role of different logical premises, and the role of what in retrospect turn out to be transitory events. This process helps to evaluate the appropriate degree of validity to claims of overinvestment in higher

education (e.g., Freeman, 1976), for example, in relation to the current concerns about the U.S. productivity decline that may be related in part to underinvestment in education and R&D.[1]

This paper does not address the question as to whether the U.S. school system is as bad as some people claim. Net returns reflect surges of population cohorts into the labor markets (supply and demand) that are somewhat independent of the system's internal efficiency over time. However, high rates of return should be evidence that additional investments made where net returns are high is not all that wasteful and inefficient.

The importance of an efficient allocation is further suggested by the fact that the stock of human and fixed capital is enormous--currently ranging from 5 to 12 times GNP by estimates based on narrower and wider definitions respectively. These measures are presented in the Appendix to this paper. Human capital is about half of that total, when all stocks are measured on the basis of real investment of direct costs (and of foregone earnings costs), cumulated and depreciated. The portion represented by private fixed capital and by housing capital has remained reasonably stable since 1947, at about 2¼ times GNP. But human capital has grown much more rapidly than GNP, with the stock created by basic education now twice GNP, and the human capital created by higher education alone rapidly approaching the size of GNP. If human capital stocks are measured on the basis of current market wages rather than original investment costs they are considerably larger than this. But the same pattern of the fastest growth of human capital created by higher education still emerges. These

and other comparisons are made possible by the relatively recent publication by the Department of Commerce (1987) of estimates of the total physical capital stocks for each year from 1925-88. For comparisons to estimates of human capital stocks, the latter are based both on original investment costs (as described in McMahon (1974), Appendix B and extended here for 1973-1989) and based on current market wages as developed by Jorgensen and Fraumeni (1989, p. 42).

The pure internal rates of return over cost to each level of education are computed first for 1967-88 using microeconomic data on earnings collected annually by the Bureau of the Census from approximately 130,000 individuals. This earnings data at each age is used with estimates of direct institutional costs plus foregone earnings costs in direct computations using the formula for the pure internal rate of return for each type of education by sex for each year. These are then compared to the annual real rates of return over cost to housing and to plant and equipment investment just published by Edwin Mills (1989).

The comparisons suggest that there is no evidence of diminishing returns to investment in higher education, in spite of the enormous increase in human capital stocks. The comparisons also offer some new insights into what may be a more socially efficient investment strategy.

I. Estimating Real Rates of Return

It is unlikely that competition and market processes will equate real rates of return as between higher education and investment in secondary education, housing, and non-housing fixed capital. Most

investment in human capital is not financed by borrowing which would force a market test. Instead it is dependent on and constrained by family income. Partly because of this, public subsidies of the direct costs of schools and colleges, and student financial aids for lower and middle income groups induce more saving (consumption foregone) by families that is invested in education than would otherwise occur. But this would equate total social rates of return, monetary plus non-monetary, only if there is no public sector failure and government decision makers always abide by this criterion. In any event, purely monetary rates of return that omit the non-monetary benefits of education during non-labor-market hours, social benefit externalities, and the implications of the effects of the distribution of education on the income distribution later should be adjusted implicitly for these omissions before any standard of equal rates of return is imposed or expected.

An analogous situation exists for investment in owner-occupied housing. There the tax deductibility of interest costs and the real estate tax shelters that existed before the tax reform, and the FDIC guarantees making lower cost deposits available to S and L's have constituted a sizable subsidy to middle and upper income groups to save and simultaneously invest in housing. With respect to investment in physical capital, there are investment tax credits, depletion allowances, and on occasion lower capital gains tax rates that also act as levers influencing the allocation of investment as among human capital, housing, and physical capital. There are also differences in risk to be considered.

The Returns to Human Capital

The returns to human capital, housing, and other fixed capital are all measured before taxes, and are therefore referred to here as social returns even though this may not account precisely for the externalities. The standard formula for computing pure internal rates of return to human capital formed through investment in education is used:

$$(1) \qquad \sum_{t=0}^{R-G} \frac{(E_t - C_t)}{(1+r^*)^t} = 0, \text{ the Net Present Value}$$

where:

r^* = the social rate of return,

E_t = the net earnings differential before taxes at age t,

C_t = the social cost of the investment (full public and private institutional cost plus foregong earnings costs), and

t = (G,..R) = age t = G at graduation[2] from the education level in question to retirement at age R.

This formula is applied to the net earnings differentials calculated from the earnings before taxes net of earnings foregone based on earnings of those of the same age and same sex with the prior level of schooling as shown in columns F through N of Appendix B. Total investment costs (C_t) including these foregone earnings and direct institutional investment costs are also shown in columns C through E of Appendix B.

Foregone earnings costs reported in the first column of Table 1-B are the earnings from the next lower level multiplied by the number of

years in school at the higher level times .75 since most students are not in school during the three summer months. To this is added direct costs for each year in Column 2 from the U.S. Department of Education as shown in the U.S. Bureau of the Census (1988, pp. 118-9). These are measured as the total current expenditure per pupil, whether financed by parents, taxes, endowments and gifts, or student loans, and added to foregone earnings to obtain total investment costs. Although the data shown in Appendix B is for 1987 earnings and 1987 costs, the formulas are identical for all the years from 1967 through 1988 for which rates of return were computed thereby providing strict comparability over time (as well as comparability to the computations cited in the references for Indonesia and Pakistan).

Productivity Growth, Ability, and Self-Selection Bias

The rates of return computed in Table 1 control for sex, age, and level of education by sorting the data. But it is also necessary to consider the advisability of adjustments for ability, potential self-selection bias, and productivity growth.

The average rate of growth of output per capita and of income per worker, which is closely related to productivity, has been 1.2% per year since 1973, and 2.1% per year up to that time. This growth over time is not reflected in cross section data, which represents earnings at the same point in time of people at various ages. As each individual moves through his or her life cycle, some growth in the average wages of all concerned can be expected due to technical change, to the capacity that most education provides to adapt to that change,

to more efficient management techniques, and to other factors. To this extent the earnings at later ages and the net earnings differentials as well as all rates of return will be understated.

The more recent studies suggest that corrections for bias due to ability and self-selection are quite small, and in any event would be approximately cancelled out by a correction for this productivity growth that operates in the other direction.[3] Becker's (1964) earlier conclusion based on five studies was that rates of return to college education were reduced from 13% to 11.5% (or by a ratio of .88). This is close to the ratio of .75 if one compares the earnings of college graduates with an IQ score of 90 (the same as the average secondary school leaver) to high school earnings (see Hinchliffe, 1987, p. 287). But many more recent studies in the 70's and 80's based on regression analysis suggest that corrections for bias arising from differences in measured ability require an even smaller or no adjustment. Rosen, for example, says that "comparison across observed realizations are a good first-order approximation to the relevant rate of return to schooling" (see Sherwin Rosen, 1987, p. 299). The alpha coefficients for higher education in these later estimates include those obtained by Griliches (.96), Griliches and Mason (.88), and Hause (.97), with Taubman and Wales (.65) reporting the lowest ratio (see McMahon and Wagner, 1982, p. 182). This assumption that the alpha coefficient is raised from approximately .88 to approximately 1.0 by productivity growth is consistent with Hause's estimate (α = .97), since it is to be noticed that Hause uses the NBER-Thorndike sample which is longitudinal data

that presumably includes the effects of productivity growth. It therefore is on this basis that the results will be reported.

Sensitivity Tests: Growth and Educational Costs

To check the quantitative significance of growth in real per capital earnings attributable to education and its contributions and capacities to adapt to technical progress, as well as the effect of rising real educational costs, some sensitivity tests were performed.

The net earnings differential first was raised throughout the age-earnings profile by a 2% per annum compound growth factor. This takes into account the fact that workers at each age, when they reach the next higher age bracket, are likely to earn somewhat more than persons are now earning in the older age group now due to technical progress that has occurred in the interim, a factor not reflected in cross-section data which refers to a moment in time. The 2% additional growth of the net earnings differential assumes that both components of the net earnings differential, that is, college graduates' earnings and foregone earnings, grow at a 2% per year compound rate. In relation to the U.S. experience, more specifically, from 1950-73 real output per worker grew at 1.9% per year, real output per capita at 2.1%, and real domestic spending by government and consumers at 2.1%, although all of these rates have fallen to 1.2% or below since that time. The effect of the 2% compound growth of earnings was to raise the real rate of return for a four year college degree for a typical male from 13% to 15%, or by precisely 2 percentage points.

With respect to changes in college costs, other than those already incorporated, a recent study by Oscar F. Porter (1990) finds that only 15% of the students beginning college in 1980 now graduate in four years. The data developed by the U.S. Department of Education for 28,000 students nationwide applies only to that one year, and so cannot be incorporated in the rates of return calculated for each year from 1967 through 1987. So a sensitivity test was performed that raised both direct costs and foregone earnings costs from 4 years, to 4 1/2 years, or by 12.5%. The effect of this on the social rate of return to a four year college degree for males was to lower it from 13% to 12%. This if anything underestimates the effect of this internal inefficiency in the universities in that only 54% of private college students had completed a degree six years after enrolling, and only 24% of black students had earned a degree within this six year period. However six years as a part-time student is close to four years of full-time study, so our four year norm is more appropriate for this group. Neither the earnings nor the costs paid by students who drop out are included in the rates of return to a bachelors level four year college education reported in Table 1, but are instead included in the costs and returns to one to three years of college which are not considered here.

Unemployment and Underemployment

The earnings used in the computations are those for all workers in the labor force age 18 and over, not just the earnings of full-time workers. Unemployment and underemployment therefore reduce average

earnings, and presumably the rates of return to education. The effects of unemployment on rates of return however are reduced by the fact that foregone earnings costs are also low.

II. Empirical Results: The Returns to Human and Physical Capital

The Returns to Investment in Housing and Physical Capital

It is necessary to briefly describe the calculation of rates of return to physical capital (further details are available in Edwin Mills (1989, p. 5) on which this section is based). To obtain the returns, in the National Income accounts, the return to housing capital which includes the imputed rental value of owner occupied housing is converted to 1982 dollars by use of the relevant GNP deflator. This is divided by the Department of Commerce cost-based estimates of the investment in the real housing stock to obtain real capital income per unit of the housing stock. To this capital return is added the capital gain generated by the capital stock that existed that year, which is the increase during the year in the real price of one unit of the capital stock.

The rate of return per constant dollar invested in plant and equipment is calculated in a similar way. Total Gross National Product less compensation of workers gross of taxes, and less the total before tax dollar incomes to housing capital considered above leaves the returns to other private non-housing capital. This in turn is divided by the new U.S. estimates of the gross nonresidential capital stock, and supplemented with the real capital gain per unit of the capital stock in each year as above. These real rates of return

are based on the gross investment in the capital stock rather than the net investment not only because no one knows whether the Commerce depreciation assumptions are accurate, but also to maintain comparability to the rates of return on the initial investment in education by each individual which is not normally depreciated within the life cycle. (However, both gross and net returns to housing capital are shown in Figure 1, and it may be noticed that they move very closely together.)

The Rates of Return to Education

Table 1 gives the social rates of return to human capital for high school and BA-level college graduates for 1967-87, which are illustrated for males and females together in Figure 1. There is no trend downward in the rates of return at either the high school or college level, or to males taken alone (Figure 2). There was a dip in the returns to college in the '72-'78 period, but the returns just prior to that in '70-'71 were extraordinarily high.[4]

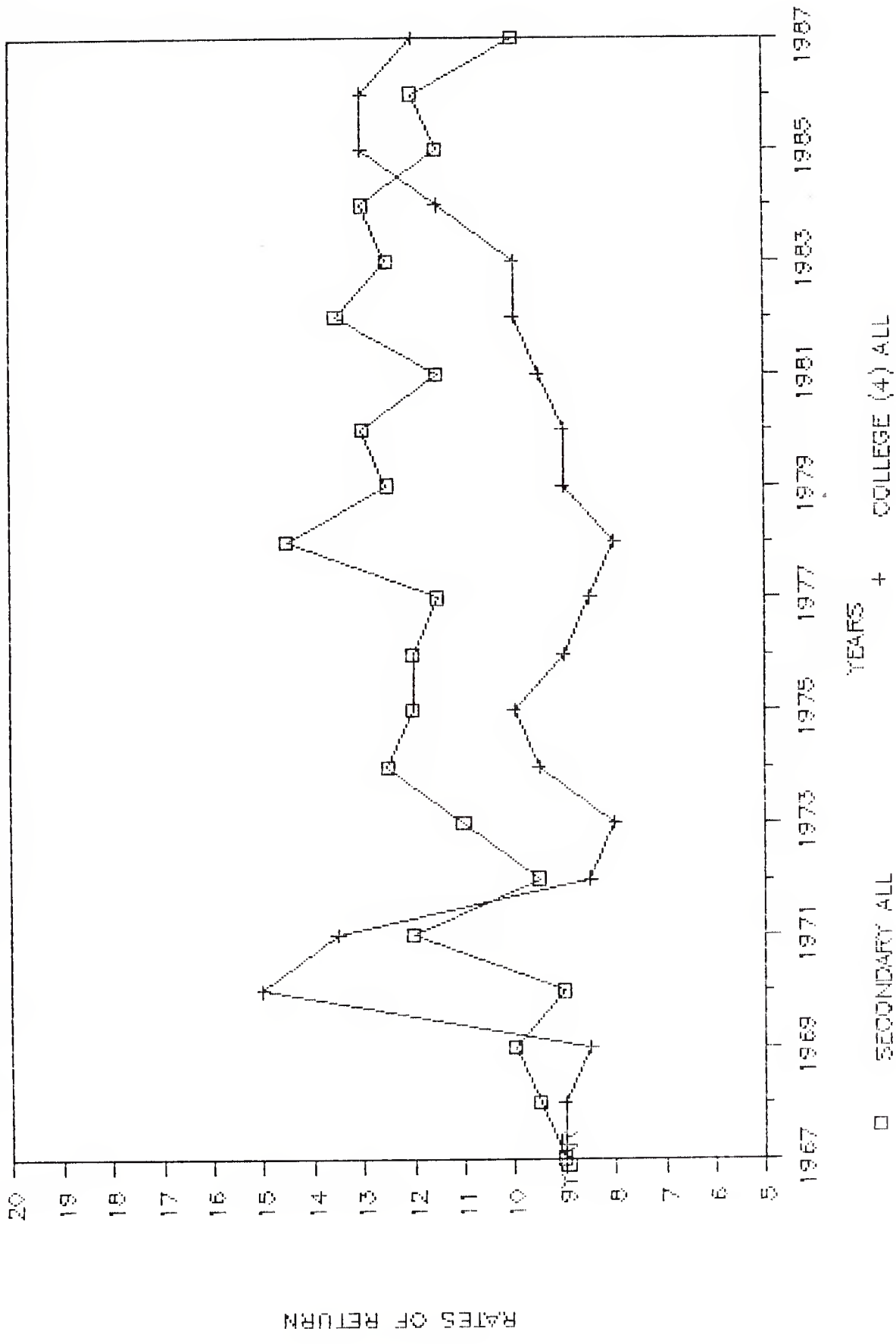
If anything there has been a modest trend upward in the returns to college for the period taken as a whole. This contrasts with the clear decline in the rates of return to junior high level schooling throughout the period. Returns to community college level programs (college 1-3) are somewhat lower throughout (about 6%) but have held relatively steady for the period as a whole at that level.

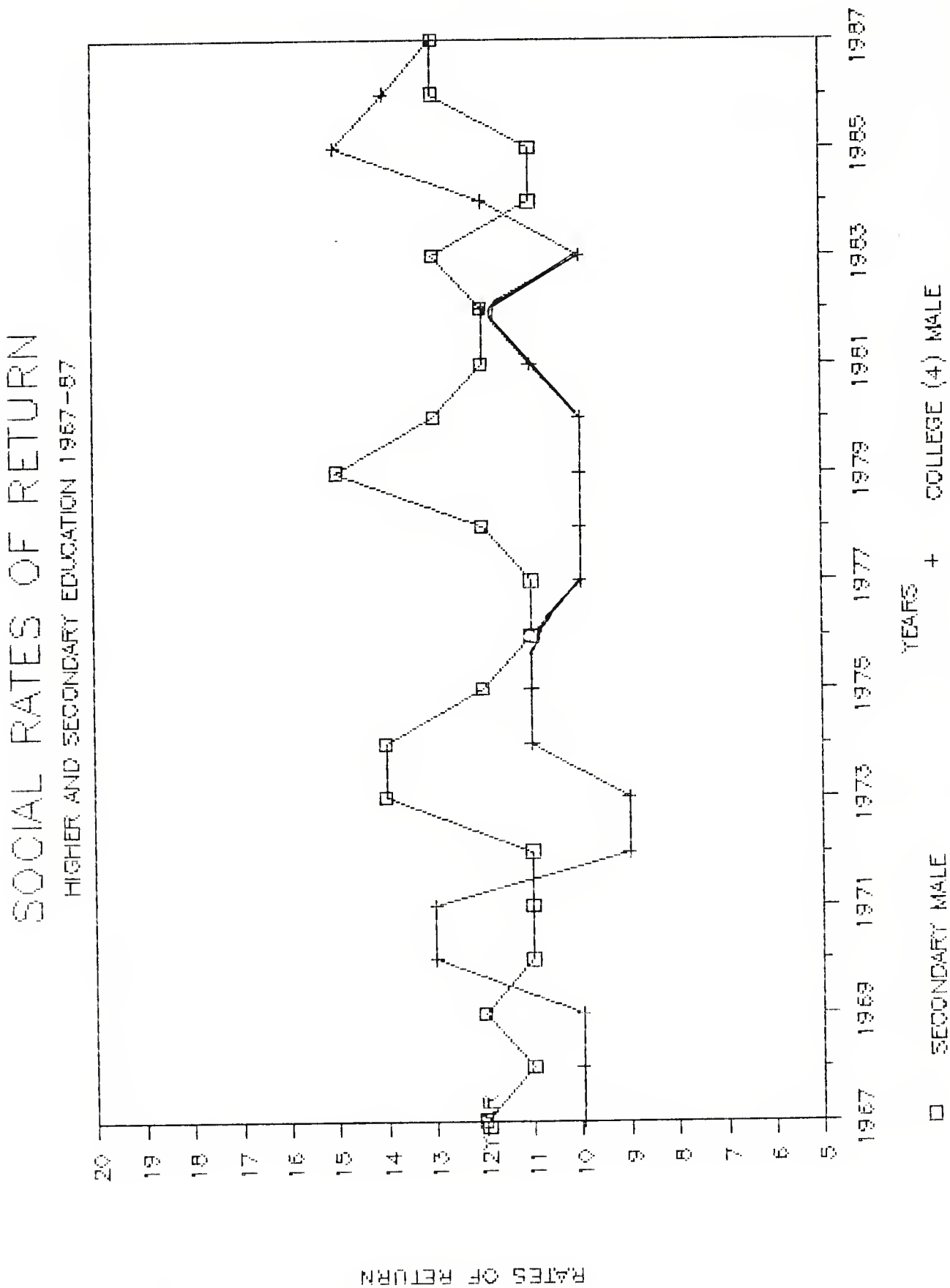
Table 1

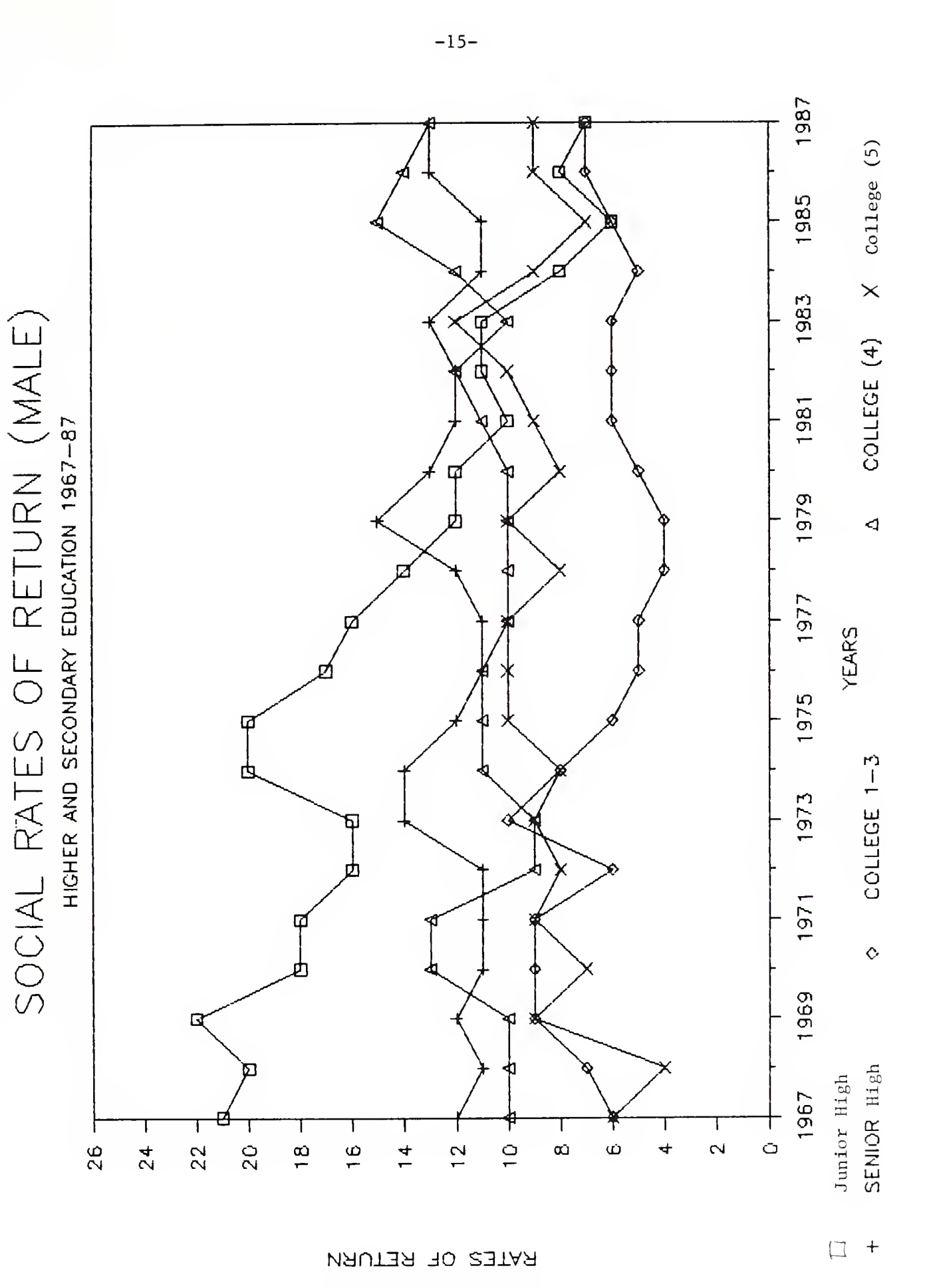
Social Rates of Return to Education in the U.S.
1967-1987

	'67	'68	'69	'70	'71	'72	'73	'74	'75	'76	'77	'78	'79
Secondary (grades 9-12)													
M	12%	11%	12%	11%	11%	11%	14%	14%	12%	11%	11%	12%	15%
F	6	8	8	7	13	8	8	11	12	13	12	17	10
ALL	9	9	10	9	12	9	11	12	12	12	11	14	12
College (4 years)													
M	10	10	10	13	13	9	9	11	11	11	10	10	10
F	8	8	7	17	14	8	7	8	9	7	7	6	8
ALL	9	9	9	15	13	9	8	9	10	9	8	8	9

	'80	'81	'82	'83	'84	'85	'86	'87	average r* 1967-1987
Secondary (grades 9-12)									
M	13%	12%	12%	13%	11%	11%	13%	13%	
F	13	11	15	12	15	12	11	7	
ALL	13	11	13	12	13	11	12	10	12.8%
College (4 years)									
M	10	11	12	10	12	15	14	13	
F	8	8	8	10	11	11	12	11	
ALL	9	10	10	10	12	13	13	12	10.2%


SOCIAL RATES OF RETURN
HIGHER AND SECONDARY EDUCATION 1967-87
RATES OF RETURN
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
YEARS
□ SECONDARY ALL
+ COLLEGE (4) ALL


SOCIAL RATES OF RETURN
HIGHER AND SECONDARY EDUCATION 1967-87
RATES OF RETURN
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
YEARS
□ SECONDARY MALE
+ COLLEGE (4) MALE


SOCIAL RATES OF RETURN (MALE)
HIGHER AND SECONDARY EDUCATION 1967-87
RATES OF RETURN
YEARS
0
2
4
6
8
10
12
14
16
18
20
22
24
26
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
□ Junior High
+ SENIOR High
◇ COLLEGE 1-3
△ COLLEGE (4)
X College (5)

A Comparison of the Rates of Return

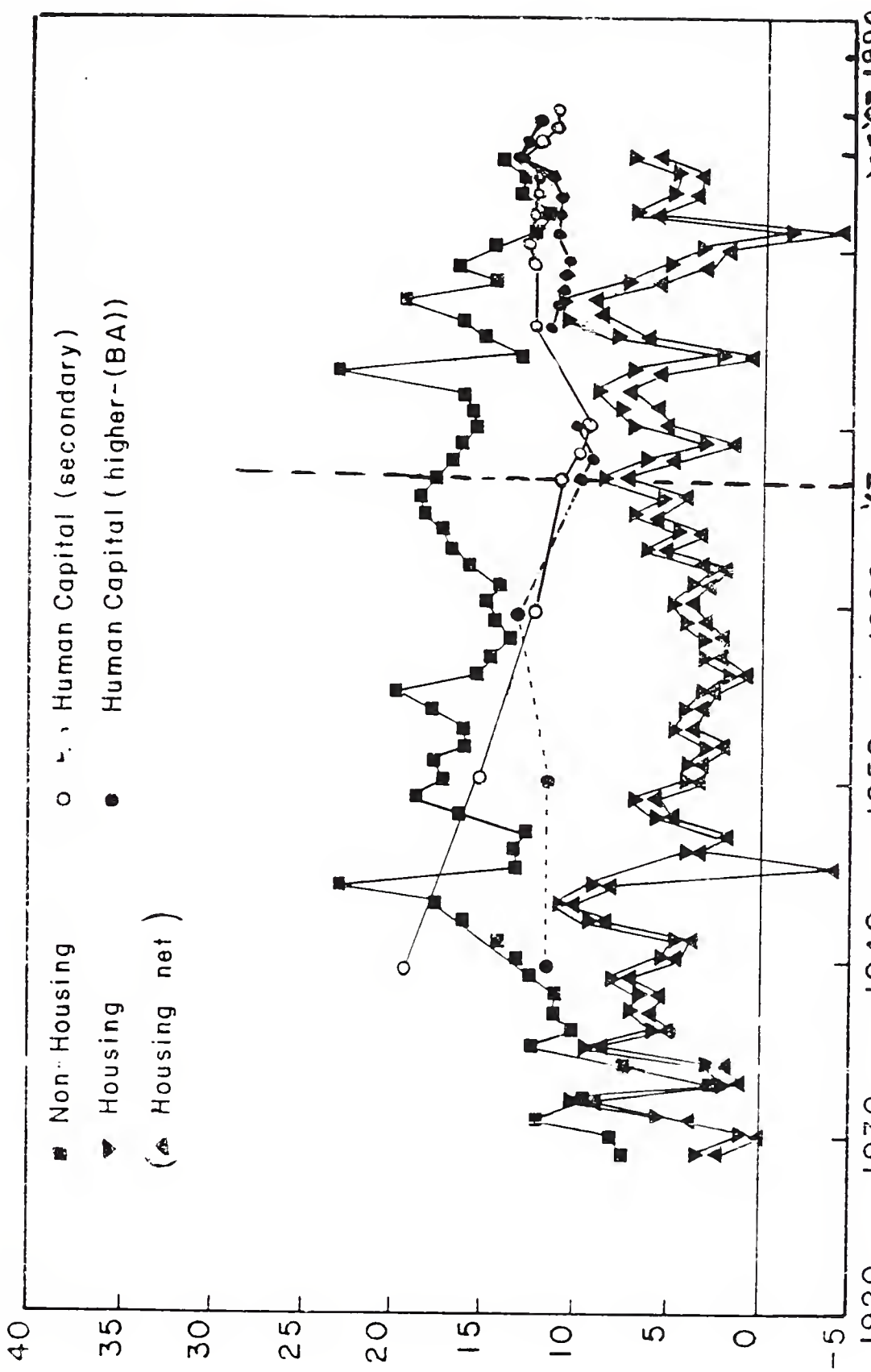
These returns to human capital are compared to the returns to housing and non-housing physical capital in Figure 4. Several significant points emerge from these comparisons.

First: It is clear that the real rates of return to higher education and also to secondary education have remained substantially above the real rates of return to housing throughout the period from 1967 through 1988. The real returns to housing capital have averaged about 4%, whereas the real returns to education have all been in the range of 10 to 15%. In the most recent years, secondary education shows a real rate of return of 13% from 1982 and 14% since 1985. Higher education (averaging males and females) yielded a real return that rose from 1980 through 1986 from 9% to 13%, but since has leveled off. The lack of evidence of diminishing returns to investment in higher education since 1967, or for that matter in the pattern since 1940 (Figure 4) is consistent with the hypothesis that the demand has increased (along with the supply) as new research and development in all fields helps to sustain a continually growing demand for highly trained graduates (see Bartel and Lichtenberg (1985) for example).

Second, the real rates of return to housing rose from 1973 to 1979, whereas real rates of return to human capital reached their trough during this same period. The real prices of housing assets rose much more rapidly from 1970 to 1980 than did the real prices of non-housing assets (see Appendix C). This was partly the result of the increased demands for housing by the wave of post war baby-boomers beginning to enter the housing market. It contributed to higher real

Figure 4

Real Returns to Human, Physical, and Housing Capital



Sources: Housing and non-housing capital: Mills (1989); human capital, 1939-1969: Psacharopoulos (1981, p. 335); human capital, 1967-1987: McMahon (see text).

rates of return on housing due to capital gains in the period from 1970 to 1979 as may be seen in Figure 4. During this same period, rates of return to both secondary education and higher education fell as can also be seen in Figure 4. This is new evidence involving housing that is consistent with Murphy and Welch's (1989) conclusion that it was entry of this group into the labor market depressing salaries of the younger age groups temporarily, and is not consistent with either an overexpansion of education or with Freeman's (1976) speculation of a secular trend.

Third, rates of return to non-housing physical capital appear to be consistently higher, averaging 15% since the end of World War II. Again there is no major trend for the period taken as a whole, although the recessions of 1974-75 and 1980-83 depressed profits and hence these returns somewhat below their levels in the earlier decades. The somewhat higher average returns to non-housing private capital may be related to this greater volatility and riskiness, but it should be noted that they also include the returns to financial intermediaries.

Finally, with respect to the social efficiency of alternative investment strategies, the evidence is consistent with the conclusion that investment in secondary education (presumably to improve its quality), investment in higher education, and investment in non-housing physical capital all yield both substantial and socially efficient returns. If the income distribution effects from wide access to basic education (e.g., lower crime rates, lower unemployment compensation and welfare costs) and externalities from higher education

(e.g., research) could be added, except for the unlikely event that the negative externalities are large, the returns would be higher than those reported. In 1985, the most recent year in which a direct comparison is possible, human capital was yielding 14% and physical capital 15%, which translates into nominal rates of return of 17.8% and 18.8% respectively when the inflation rates in that year are added.

III. Summary of Conclusions

A new insight is offered by the dramatic decline in the real rates of return to junior high school level secondary education from 21% in 1967 to 7% in 1987 (Figure 3). During this period the real rates of return to a four year college education held relatively steady at 10-11%, and, except for a dip in the late 70's rose to the 12-14% range during 1984-87 (Table 1 and Figures 1-3). There is no evidence of a trend toward diminishing returns to investment in higher education in the United States, for males and for females alike (Figure 2), in spite of the large number of new college graduates entering the labor force throughout this period. The real rates of return to the high school level alone can also be distinguished, and hold steady at 12% with no trend, but with minor fluctuations. Whether the falling scores on standard math, science, and social science tests for those leaving secondary school means increasing inefficiency or more students taking the tests, or both, and in spite of rising college costs due in part to longer times taken to graduate, the effect on rates of return at the senior secondary levels is not drastic. The pattern that is observed

would seem to be more consistent with the declining value in the job market of services provided by those who have only an eighth grade education (an inferior good?), and the comparative advantage of college graduates in implementing the new technology, a phenomenon noted earlier in a different context by Bartel and Lichtenberg (1987).

In relation to the yield on alternative types of investment, the estimates suggest that there appears to be overinvestment in housing capital, relative to plant and equipment and relative to human capital. An overall real rate of return to investment in housing averaging 4% from 1929-67 and 5% since that time is considerably below the 15% real rate of return to plant and equipment, even though it was down to 13 or 14% in the 1980's, and also well below the 12% overall real rate of return to securing completions of high school or college. It could be argued that the Department of Commerce in making imputations for the rental value of owner-occupied housing underestimates the true return by not including the externalities or spill-over benefits accruing to the community from home ownership. But there are non-monetary private consumption benefits and externalities from investments facilitating completion of high school and of college as well (e.g., lower welfare and unemployment costs, lower crime rates, capacity to participate in democratic processes, etc.). There are of course some negative externalities, and some instances of public sector non-market failure in the public schools. But there are also negative externalities related to housing (the huge cost of the S&L bailout). Jorgenson and Fraumeini (1989, p. 44) have estimated the

value of the human capital stock due to the non-monetary private consumption benefits and externalities to be over twice its value for purely market activities. It is unlikely that the returns to owner-occupied housing are underestimated to this extent.

If the real rates of return computed here are converted to nominal rates by adding the inflation rate (current 4.6%), the result is a 16.6% nominal rate of return to securing completion of high school or college, and about a 19.6% nominal rate of return to investment in physical capital, gross of the commissions of financial intermediaries and risk premiums. With no evidence of diminishing returns to investment in higher education, somewhat larger percentage increases both in investment in plant and equipment, and in human capital relative to the rate of increase in investment in housing would appear to be a socially efficient investment strategy.

Notes

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[1]See for example the extensive discussion of the contribution of human capital in the Economic Report of the President, Council of Economic Advisers (1988, Ch. 5).

[2]This is the rate of return, therefore, as of the date the schooling at the relevant junior secondary, high school, or college level was begun, rather than as of the date of graduation since this is what would appear to be the most relevant when contemplating a new social investment decision.

[3]To control for self-selection bias, Cohn and Rhine (1989) use a two-step regression technique that first estimates a selectivity variable LAMBDA based on the probability of choosing college rather than entering the labor force upon completion of high school. But when the LAMBDA is included in the wage equation, it is not significant.

[4]Cohn and Rhine (1989) obtain somewhat lower rates of return for white males. In relation to those shown in Table 1 (in parentheses), they are 1969 9.26% (10%); 1974 8.13% (11%); 1978 6.09% (10%); and 1982 6.87% (12%). However, they used the Mincer earnings function approach, with a regression coefficien thtat averages over all levels. The real rates of return to the junior high school level declined steadily throughout this period, and the earlier regression (ibid, 1989, p. 686) includes SES which inappropriately removes most of the variation in investment rates, and hence the returns associated with that investment. These two factors probably explain the difference.

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APPENDIX A

Human, Physical, and Knowledge Capital Stocks and Data Used (in 1972 Constant Dollars)

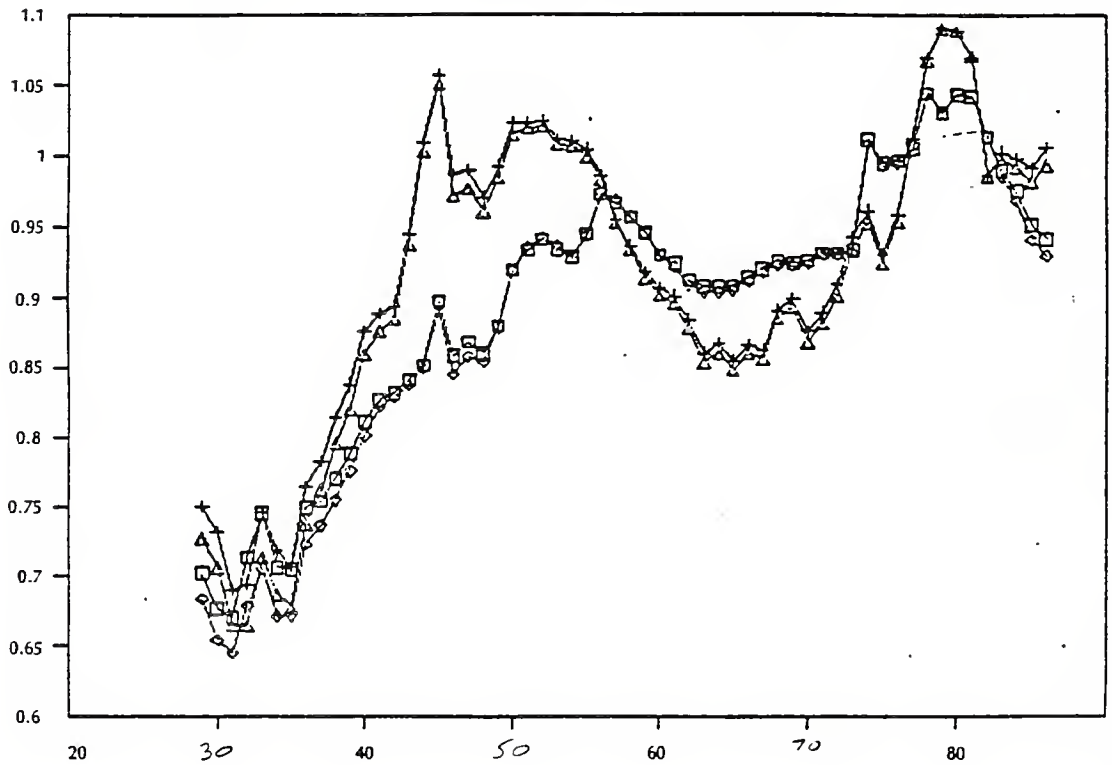
	Investment-Cost Based				Current-Wage Based					
			Human Capital		Human Wealth					
Year	Physical Capital K	R&D Capital A	K-12 H	Higher Ed. HE	K-12 H'	Higher Ed. HE'	GNP Y	Natural Output Y_N	Labor Force NS	G Co
1947	1230.5	32.9	422.1	124.9	NA	NA	507.5	498.4	59.4	0.
1948	1247.8	35.9	444.0	133.4	6383	1203	532.3	509.9	60.6	0.
1949	1274.4	39.2	488.5	145.3	6855	1321	538.8	526.5	61.3	0.
1950	1327.5	42.1	541.3	166.3	7176	1439	585.3	551.8	62.2	0.
1951	1383.3	45.4	568.9	186.4	7084	1460	634.4	578.4	62.0	0.
1952	1446.2	49.4	617.2	210.5	7241	1568	657.6	606.2	62.1	0.
1953	1512.8	55.1	674.4	218.4	7800	1764	686.8	635.3	63.0	0.
1954	1574.0	62.3	733.4	217.3	8190	1891	684.4	661.6	63.6	0.
1955	1644.4	69.1	722.7	228.0	8271	1955	727.2	681.6	65.0	0.
1956	1708.9	77.7	796.6	243.8	8631	2080	747.2	702.2	66.6	0.
1957	1766.4	87.2	843.9	247.1	9083	2246	764.7	723.5	66.9	0.
1958	1817.1	97.1	829.6	261.4	9648	2393	764.3	746.8	67.6	0.
1959	1878.6	107.3	952.9	284.3	9637	2489	813.5	771.1	68.4	0.
1960	1938.5	117.8	988.1	301.2	9955	2588	835.5	796.2	69.6	0.
1961	1997.7	128.0	1059.3	321.1	10480	2758	862.3	822.1	70.5	0.
1962	1066.0	138.2	1126.5	352.3	10734	2947	914.1	848.9	70.6	0.
1963	2143.8	148.9	1204.8	356.5	10892	3065	956.3	876.7	71.8	0.
1964	2230.3	159.9	1328.0	378.0	11656	3341	1012.1	907.9	73.1	0.
1965	2331.5	170.9	1476.6	404.5	12367	3616	1077.9	904.8	74.5	0.
1966	2437.2	182.3	1615.4	437.9	13030	3936	1143.7	974.9	75.8	0.
1967	2534.1	192.5	1749.0	470.7	13451	4269	1179.0	1010.2	77.3	0.
1968	2642.2	201.4	1836.0	525.5	13617	4531	1332.8	1046.8	78.7	0.
1969	2748.3	209.9	1855.1	544.3	13828	4727	1267.8	1084.8	80.7	0.
1970	2836.6	216.7	1874.2	581.4	14465	5165	1268.2	1123.7	82.8	0.
1971	2934.1	221.8	2007.8	617.1	15171	5741	1310.1	1162.5	84.4	0.
1972	3050.4	226.9	2222.4	670.2	15590	6009	1381.0	1202.5	87.0	0.
1973	3178.4	231.8	2314.9	724.6	14998	7795	1454.0	1243.9	89.4	0.
1974	3277.1	235.7	2417.8	785.0	15657	6613	1458.5	1285.4	91.9	0.
1975	3345.1	238.4	2526.7	841.5	15107	7048	1456.7	1323.6	93.8	0.
1976	3427.1	242.1	2639.3	900.9	15474	7277	1525.4	1362.5	96.2	0.
1977	3532.4	246.1	2754.7	958.9	15226	7556	1589.1	1402.5	99.0	0.
1978	3657.7	251.1	2868.8	1022.3	15717	7682	1665.3	1443.7	102.3	0.
1979	3785.0	257.2	2979.5	1084.1	15232	8017	1702.6	1485.8	105.0	0.
1980	3876.1	264.0	3082.1	1156.9	13452	7782	1699.8	1525.8	106.9	0.
1981	3959.4	271.7	3182.6	1234.4	13103	7759	1743.0	1565.9	108.7	0.
1982	4017.0	280.0	3283.7	1312.3	13307	8008	1716.6	1594.9	110.2	0.
1983	4090.5	289.5	3383.1	1392.8	13787	8449	1779.3	1632.5	111.6	0.
1984	4212.2	301.2	3494.7	1474.3	14224	8823	1853.8	1671.1	113.5	0.
1985	4350.3	314.6	3603.2	1555.0			1919.6	1710.5	115.5	0.
1986	4500.6	327.3	3714.9	1637.2			1979.7	1750.9	117.8	0.
1987	4640.3	339.8	3831.6	1732.3			2047.6	1792.2	119.9	0.
1988	4789.3	352.3	3951.9	1833.0			2131.1	1834.5	121.7	0.
1989	4943.1	364.1	4076.0	1939.5			2191.7	1877.9	123.9	0
Ratio to GNP:										
'47	2.42	.06	.83	.25	'48	12.6	2.4		'47	.117
'89	2.25	.17	1.85	.88	'84	7.9	4.9		'89	.056

FOR COMPUTATION OF RATES OF RETURN

	COST OF EDUCATION			MEAN ANNUAL EARNINGS AT DIFFERENT AGES								
				AGE GROUPS								
	Foregone Earnings	Direct Cost	TOTAL	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
	C	D	E	F	G	H	I	J	K	L	M	N
NO SCHOOL(M)	0.00	0.00	0.00	na	na	na	na	na	na	na	na	na
NO SCHOOL(F)	0.00	0.00	0.00	na	na	na	na	na	na	na	na	na
SOME ELE (LESSTHAN 8)M												
COST & EARNINGS	0.00	-18156.00	0.00	7180.00	10906.00	12927.00	15068.00	14332.00	15763.00	15892.00	14485.00	14951.00
NET EARNINGS DIF.FROM THE LAST LEV.				ERR	ERR	ERR	ERR	ERR	ERR			
SOME ELE (LESSTHAN8)F												
COST & EARNINGS	0.00	-18156.00	0.00	4711.00	5515.00	6680.00	7331.00	7021.00	8154.00	8218.00	7574.00	6487.00
NET EARNINGS DIF.FROM THE LAST LEV.				ERR	ERR	ERR	ERR	ERR	ERR			
ELEMENTARY (K-8)(M) (+2 over S.Ele)												
COST & EARNINGS	0.00	-6052.00	-6052.00	6902.00	10056.00	13066.00	15929.00	17251.00	18967.00	18856.00	18156.00	16625.00
NET EARNINGS DIF.FROM THE LAST LEV.				-278.00	-850.00	139.00	861.00	2919.00	3204.00	2964.00	3671.00	1674.00
ELEMENTARY (K-8) (+2 over S.Ele.)												
COST & EARNINGS	0.00	-6052.00	-6052.00	5920.00	7254.00	8572.00	9540.00	9523.00	9410.00	9266.00	8472.00	7076.00
NET EARNINGS DIF.FROM THE LAST LEV.				1209.00	1739.00	1892.00	2209.00	2502.00	1256.00	1048.00	898.00	589.00
JUN. HIGH SCHOOL GEN.(M) na?												
COST & EARNINGS	-7066.50	-9078.00	-16144.50	6030.00	13205.00	16317.00	16873.00	19453.00	24493.00	22940.00	22226.00	19161.00
NET EARNINGS DIF.FROM THE LAST LEV.				-872.00	3149.00	3251.00	944.00	2202.00	5526.00	4084.00	4070.00	2536.00
JUN. HIGH SCHOOL GEN (F) na?												
COST & EARNINGS	-10353.00	-9078.00	-19431.00	3752.00	7668.00	8656.00	8367.00	9304.00	9708.00	10229.00	9154.00	9929.00
NET EARNINGS DIF.FROM THE LAST LEV.				-2168.00	414.00	84.00	-1173.00	-219.00	298.00	963.00	682.00	2853.00
SEN.HIGH SCHOOL GEN.(M) 4 YRS.												
COST & EARNINGS	-20706.00	-18156.00	-38862.00	10039.00	18179.00	21369.00	23826.00	25895.00	27282.00	26654.00	25928.00	23676.00
NET EARNINGS DIF.FROM THE LAST LEV.				7274.00	11211.00	11727.00	12622.00	8644.00	8315.00	7798.00	7772.00	7051.00
SEN.HIGH SCHOOL GEN.(F) 4YRS.												
COST & EARNINGS	-17760.00	-18156.00	-35916.00	7274.00	11211.00	11727.00	12622.00	12988.00	13892.00	13083.00	12289.00	12755.00
NET EARNINGS DIF.FROM THE LAST LEV.				1354.00	3957.00	3155.00	3082.00	3465.00	4482.00	3817.00	3817.00	5679.00
COLLEGE (1-3 YEARS)(M)												
COST & EARNINGS	-15058.50	-18480.00	-33538.50	8005.00	19794.00	24242.00	27686.00	31133.00	35098.00	35194.00	29308.00	29273.00
NET EARNINGS DIF.FROM THE LAST LEV.				-2034.00	1615.00	2873.00	3860.00	5238.00	7816.00	8540.00	3380.00	5597.00
COLLEGE (1-3 YEARS)(F)												
COST & EARNINGS	-10911.00	-18480.00	-29391.00	6931.00	13646.00	14759.00	16637.00	17283.00	16861.00	16064.00	14096.00	13081.00
NET EARNINGS DIF.FROM THE LAST LEV.				-343.00	2435.00	3032.00	4015.00	4295.00	2969.00	2981.00	1807.00	326.00
COLLEGE (4 YEARS)(M)												
COST & EARNINGS	-30117.00	-36960.00	-67077.00	14807.00	26086.00	31437.00	36648.00	39694.00	43899.00	47615.00	40751.00	41578.00
NET EARNINGS DIF.FROM THE LAST LEV.				4768.00	7907.00	10068.00	12822.00	13799.00	16617.00	20961.00	14823.00	17902.00
COLLEGE (4 YEARS)(F)												
COST & EARNINGS	-21822.00	-36960.00	-58782.00	12435.00	18430.00	20096.00	18989.00	19933.00	20859.00	18696.00	17925.00	15882.00
NET EARNINGS DIF.FROM THE LAST LEV.				5161.00	7219.00	8369.00	6367.00	6945.00	6967.00	5613.00	5613.00	3127.00
COLLEGE (5 YRS AND UP)(M)												
COST & EARNINGS	-22210.50	-18480.00	-40690.50	9803.00	25447.00	36946.00	44911.00	49594.00	42233.00	51881.00	45893.00	46000.00
NET EARNINGS DIF.FROM THE LAST LEV.				-4924.00	-639.00	5509.00	8263.00	9900.00	-1666.00	4266.00	5142.00	4422.00
COLLEGE (5 YRS AND UP)(F)												
COST & EARNINGS	-10652.50	-18480.00	-37132.50	11760.00	19769.00	23814.00	24705.00	26960.00	26584.00	26568.00	24967.00	22015.00
NET EARNINGS DIF.FROM THE LAST LEV.				-675.00	1339.00	3718.00	5716.00	7027.00	5725.00	7872.00	6004.00	4133.00

Figure 1

Real Prices of Housing and Non-Housing Assets



+ Δ HOUSING

□ NON-HOUSING

SOURCE: MILLS (1987).